

# Technology Standing Committee Status Report

Greg Follen, Bill Haller

April 24th, 2013  
Environment DG Meeting

# Presentation Outline

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- SC Organizational Updates
- FY13 Plans
- Identification of issues/needs
- Summary

# SC Organizational Updates

## 2013 Membership

|                               |                                      |
|-------------------------------|--------------------------------------|
| Greg Follen (NASA Co-Chair)   | Muni Majjigi (GEAE)                  |
| Bill Haller (NASA Co-Chair)   | Joseph Zelina (GEAE)                 |
| Phil Arcara (NASA)            | Sandy Webb (Environmental Assistant) |
| Mike Marcolini (NASA)         | John Whurr (Rolls Royce)             |
| Don Weir (Honeywell)          | Dan Allyn (Boeing)                   |
| Daniel Brown (Honeywell)      | William Herkes (Boeing)              |
| Costas Baltas (P&W)           | James Hileman (FAA)                  |
| Dom Sepulveda (P&W)           | Joe DiPardo (FAA)                    |
| Arthur Rypinski (OST)         | Warren Gillette (FAA)                |
| Jia Yu (Goodrich)             | Terry Thompson (Metron)              |
| Michelle Kirby (Georgia Tech) | Bruno Miller (Metron)                |

# FY13 Plans

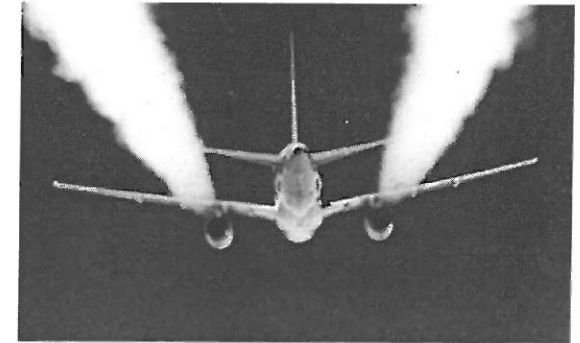
**The FY13 activities will emphasize 2020-2035 technologies for reduced emissions, noise and increased fuel burn. Investigate the effect of alternative fuels and associated technologies on emissions.**

- Re-establish Monthly telecoms
- Maintain coordination with Operations Standing Committee
- Assess and refine Alternative Fuels impact to Emissions and Fuel Burn in the Technology Standing Committee's Table 1 & Table 1-1(Alt Fuels) Targets.
- Continue to evaluate most promising Technologies that impact Noise, Emissions, Fuel Burn Targets
- Develop initial Table 2 targets by seat class for 2020-2035.

| FY13 Plans   | Status   |
|--|--|
| Re-establish Monthly updates   | 3/28, 4/18 telecoms  |
| Maintain coordination with Operations Standing Committee   | On Going   |
| Assess and refine Alternative Fuels impact to Emissions and Fuel Burn in the Technology Standing Committee's Table 1 & Table 1-1(Alt Fuels) Targets. | See charts 5-9, discuss ACCESS flight results when available,                        |
| Continue to evaluate most promising Technologies that impact Noise, Emissions, Fuel Burn Targets   | Monitoring NASA ARMD, CAEP, AEC, CAAFI<br>Review 2013 IPSA Analysis (when available) |
| Develop initial Table 2 targets by seat class for 2020-2035.   | Subject of telecoms during summer 2013   |

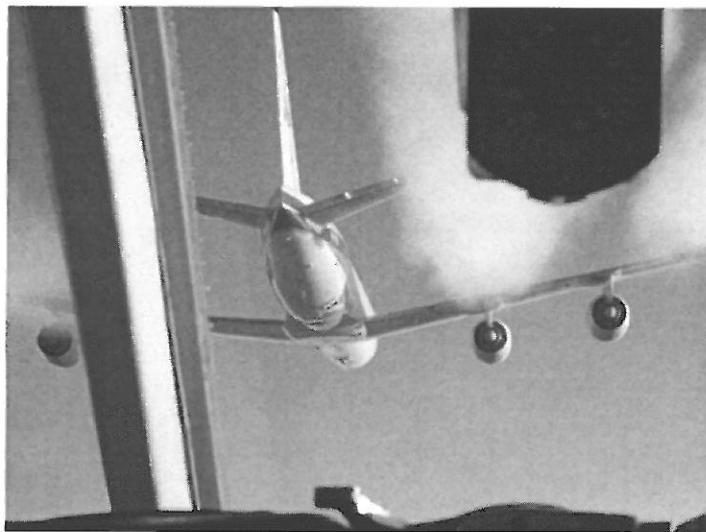
# ACCESS Objectives

1. Characterize fuel effects on aircraft particle and gas phase emissions at cruise altitudes
2. Examine the evolution (growth, changes in composition/microphysical properties) of exhaust and contrail particles as plumes age and become mixed with background air.
3. Investigate the role of black carbon concentrations and properties and fuel sulfur in regulating contrail formation and the microphysical properties of the ice particles.
4. Survey black carbon and gas-phase emissions and contrail properties from commercial aircraft at cruise in air-traffic corridors



In early March, the FAP/Fixed Wing Project began a series of flights using NASA's DC-8 flying laboratory to study the effects of alternate biofuel on engine performance, emissions and aircraft-generated contrails at altitude. This flight campaign, known as **The Alternative Fuel Effects on Contrails and Cruise Emissions (ACCESS)** research, involved flying the DC-8 as high as 40,000 feet while an instrumented NASA Falcon HU-25 aircraft trails behind at distances ranging from 300 feet to more than 10 miles.

# ACCESS Experiment

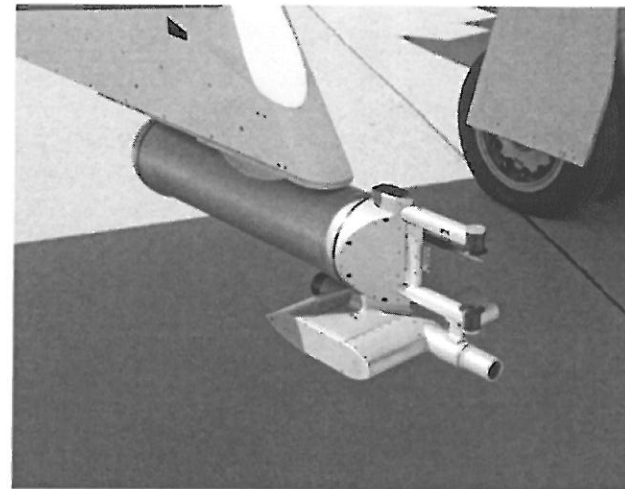


DC-8 and Falcon  
Chase Aircraft in flight

# ACCESS Experiment

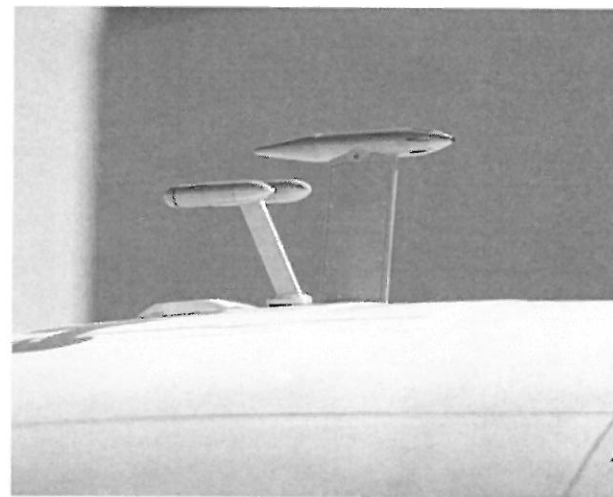


Falcon, HU25, Aircraft



Wingtip Pylons for Cloud Probes

Gaseous and Aerosol  
probes mounted on  
top of fuselage





# ACCESS Experiment



## Ground Testing



# ACCESS Status

- Series of ground/flight tests were conducted in March/April timeframe
  - Used blend of HEFA/JP-8 in one engine for comparison
  - Flight campaign just recently concluded (mid-April)
- Data reduction currently underway
- Preliminary discussions about having workshop (summer '13?) to disseminate ACCESS results

## N+3 Noise Goal

- N+3 Noise Goal Assessment completed last fall (presented at Nov. mtg)
- Kevin Shepherd and Mike Marcolini presented process and proposed goal level to Fundamental Aeronautics Program leadership on 2/11/13
- **Outcome:** NASA's Fundamental Aeronautics Program accepted & adopted the recommended goal level of -52 EPNdB cum for "N+3" time frame

v2013.1

| TECHNOLOGY BENEFITS*  | TECHNOLOGY GENERATIONS<br>(Technology Readiness Level = 4-6) |              |            |
|---|--|--------------|------------|
|   | N+1 (2015)   | N+2 (2020**) | N+3 (2025) |
| Noise<br>(cum margin rel. to Stage 4)                             | -32 dB   | -42 dB       | -52 dB     |
| LTO NOx Emissions<br>(rel. to CAEP 6)                             | -60%   | -75%         | -80%       |
| Cruise NOx Emissions<br>(rel. to 2005 best in class)              | -55%   | -70%         | -80%       |
| Aircraft Fuel/Energy Consumption†<br>(rel. to 2005 best in class) | -33%   | -50%         | -60%       |

\* Projected benefits once technologies are matured and implemented by industry. Benefits vary by vehicle size and mission. N+1 and N+3 values are referenced to a 737-800 with CFM56-7B engines, N+2 values are referenced to a 777-200 with GE90 engines

\*\* ERA's time-phased approach includes advancing "long-pole" technologies to TRL 6 by 2015

‡ CO2 emission benefits dependent on life-cycle CO2e per MJ for fuel and/or energy source used

## Current Version of Subsonic Transport System Level Metric Chart

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# Coordination with AEC/CAAFI

- **AEC Roadmap is a clearinghouse of information about aviation PM research**
  - Serves as a source of information on policy drivers, findings from emissions research projects, current knowledge gaps, and plans for future research
- **Topics to be addressed at meeting to be held May 14-15, 2013 in Washington, DC include:**
  - Policy issues
  - Health impacts
  - Climate impacts
  - Volatile PM & secondary pollutants
  - Current emissions research
  - Emissions source characterization
  - Modeling & measurements
  - Mitigation strategies
  - Future research
- **CAAFI, the Commercial Aviation Alternative Fuels Initiative, coordinates sustainable alternative fuels development issues on behalf of the aviation industry**
  - Broad participation by governmental agencies and the military, airlines, aircraft manufacturers, engine manufacturers, technology developers, agricultural interests, and others
- **Recent developments and topics of interest within CAAFI include:**
  - Fuel readiness measures
  - Feedstock readiness measures
  - Environmental progression/fuel sustainability
  - Fuel certification
  - Supply security
  - Commercialization progress
  - Economic improvement
- **These forums provide data/insight potentially useful for evaluating and refining targets presented in the Technology Standing Committee's Table 1 and 1.1**

# Issues/Needs

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- Working to establish a day/time that would be amenable to a majority of the TSC membership to enable better participation
  - Could Andrea help us with this (set up Doddle poll)?

## Summary

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- Have re-engaged TSC membership
  - Monthly telecoms have been started again
  - Looking for convenient day/time to ensure better attendance
- Selecting topics for discussion based on NASA, AEC, CAAFI activities
- Flight campaign to investigate effects on alternative fuels on contrails (ACCESS) recently completed
  - Test results to be disseminated over next few months
- Based on previous noise assessment, the “N+3” Noise goal has been changed to 52dB cum below Chapter 4